

Encephalartos imbricans (Zamiaceae): A New Species from Uganda

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ABSTRACT. *Encephalartos imbricans*, a new species from Uganda, is described, illustrated, and circumscribed in terms of other tropical African arborescent species. It is a large arborescent plant, with leaflets mostly strongly incubously overlapping. The strobili are green and glabrous; the megastrobilus is ovoid, shortly pedunculate, with the surfaces of the bullae wrinkled; the microstrobili emerge in succession, being narrowly ovoid, long-pedunculate, with the surfaces of the bullae smooth.

Encephalartos is widespread in the eastern parts of Africa, from the Eastern Cape Province of South Africa to southern Sudan, extending westward through equatorial Africa to Ghana and Nigeria (Goode, 1989: 244; Fig. 1). Nowhere is it common; it occurs mostly as relic populations, of which a considerable percentage must be considered to be in danger of extinction. The description of *E. imbricans* brings the number of described and recognized taxa to 57.

***Encephalartos imbricans* Vorster, sp. nov.** TYPE: Uganda. Near northern shore of Lake Victoria, Oct. 1994, P. Heibloem sub P. Vorster 3034 (holotype, K). Figures 2–5.

Planta magna arborescens. Foliola plerumque valde incubata, minime leviter falcata, dentibus in marginibus ambobus ad spatium 25–50 mm et dentibus 3–4 confertis concentratis ad basin marginis superioris. Strobili virides, glabri, bullarum porcis mediolateralibus integris; megastrobili ovoidei, breve pedunculati, bullarum faciebus radialiter rugosis; microstrobili in successione emergentes, anguste ovoidei, longe pedunculati, bullarum faciebus laevigatis.

Large arborescent, unbranched plant; suckering profusely from base. Stem up to 6 m long, prostrate after 1.5–2.0 m from base, 400–650 mm diam., covered with old leaf bases. Fronds numerous, spreading, straight, emerging fresh medium green and maturing to dark glossy green, about 2(–3.5) m long, leaflets gradually reduced to prickles toward proximal part of petiole to leave no prickle-free petiole; median leaflets orientated

at angle of about 45° with rachis toward apex of frond, opposing leaflets are in the same plane as seen in cross section of leaf, very narrowly ovate and very slightly falcate, with teeth 25–50 mm apart on both margins and often 3–4 closely spaced teeth near base of upper margin, mostly strongly incubously overlapping, 200–250 mm long and up to 22 mm wide. Megastrobili 2–3, ovoid with apical sporophylls sterile, shortly pedunculate with exposed peduncle 30–40 mm long, glaucous green, glabrous, about 300 mm long and 180 mm diam.; bullae of sporophylls moderately projecting, terminal facet centrally situated and about 1/3 the horizontal diameter of bulla, median facet differentiated in most sporophylls, ridges separating facets clearly differentiated and simple, terminal facet smooth but other facets radially rugose. Microstrobili 5–8, emerging and maturing in succession, each carried on a stout peduncle up to 300 mm long; strobili glaucous green, glabrous, about 300 mm long and 90 mm diam. at maturity; bullae of sporophylls moderately projected, slightly drooping, only terminal facet differentiated and about 1/3 the horizontal diameter of bulla, smooth. Seed covered with orange (not red) sarcotesta, about 45–50 mm long and 25–30 mm wide; with sarcotesta removed about 40 mm long and 18–24 mm wide.

Variation. A concentration of 3 to 4 closely spaced teeth near the base of the upper margin is present in most (Fig. 2B), but not all (Fig. 3), leaflets. Likewise, the majority of plants have strongly overlapping leaflets; but through a quirk of fate the frond collected for the type specimen has well-spaced leaflets—it probably developed in a situation where it was shaded by other plants and thus became etiolated.

Phenology. During October the plants had fresh male and female cones, and seeds from the previous season were scattered about. A mature megastrobilus collected at this time disintegrated in mid-November, suggesting that the megastrobili take slightly more than a year to mature.

Geographical distribution and habitat. Known

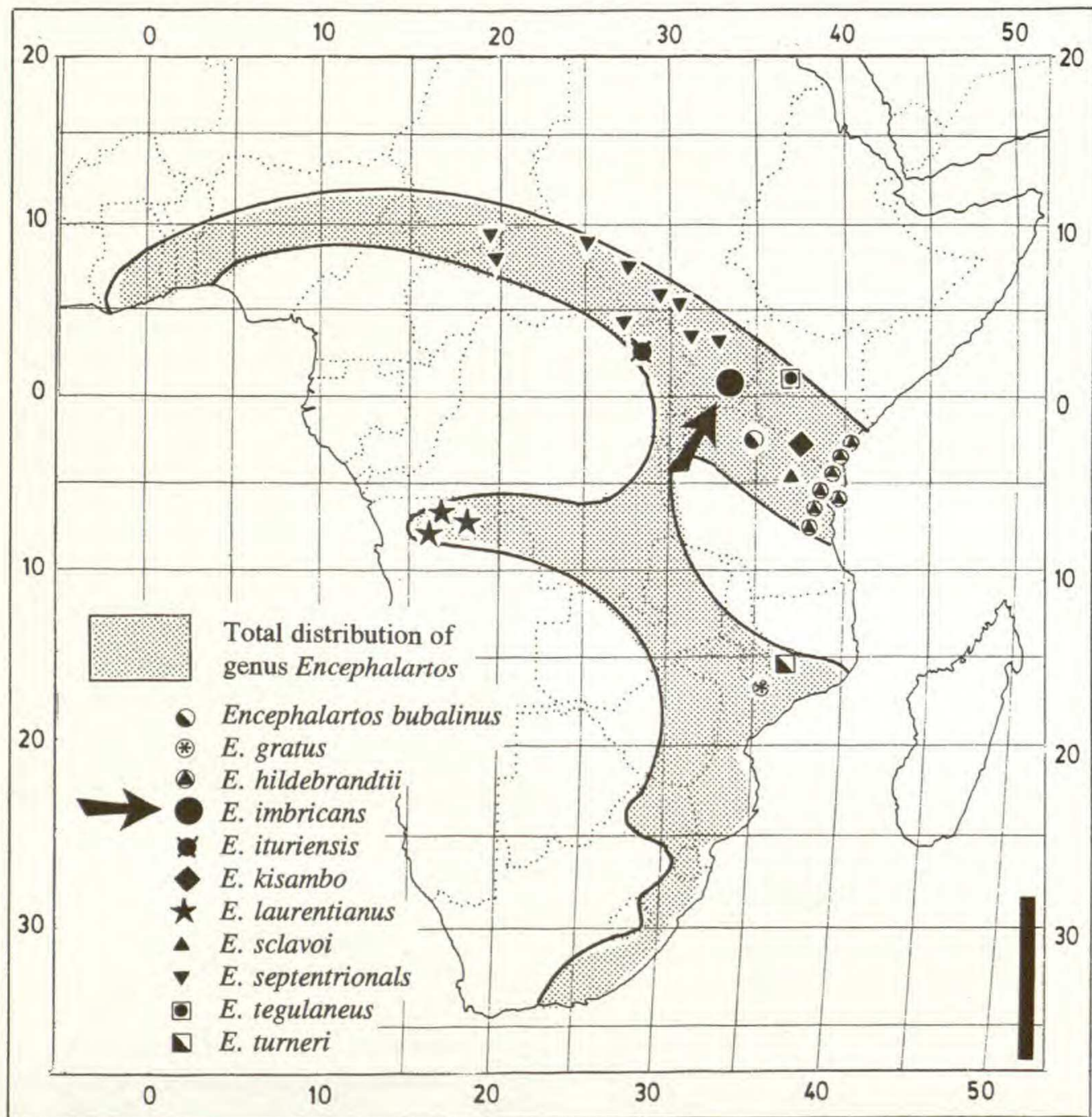


Figure 1. *Encephalartos imbricans* Vorster. Known geographical distribution in relation to distributions of other tropical African arborescent species. Based on Stevenson et al. (1990b) and Goode (1989). Scale bar = 1000 km.

only from two populations on the northern shore of Lake Victoria, where it occurs on two adjacent low hills in otherwise fairly flat country (Fig. 1). It grows on bare granite outcrops, wedged in crevices from which the plants cannot escape, in minimal soil, and under intense insolation. These outcrops (Fig. 6) have minimal vegetation, yet the charred trunks of *Encephalartos imbricans* testify that the plants are subject to periodic burning, and suitable niches for seedling establishment must be very scarce.

Conservation status. The population visited consisted of about 300 individuals. It appeared to be vigorous and was coning, yet no young plants or

evidence of seedling regeneration were seen. It seems likely that the number of plants is in equilibrium with the limited extent of the specialized habitat. Seed dissected contained no embryos, and no insects that could be suspected of being pollen vectors were found in either male or female strobili. We therefore conclude that these populations are vulnerable to overcollecting, and, accordingly, the precise locality is not made public.

Affinities. Within *Encephalartos*, interspecific relationships are still poorly understood. For many years species were separated solely on vegetative characteristics (Vorster, 1993). There does indeed seem to be a considerable amount of convergence

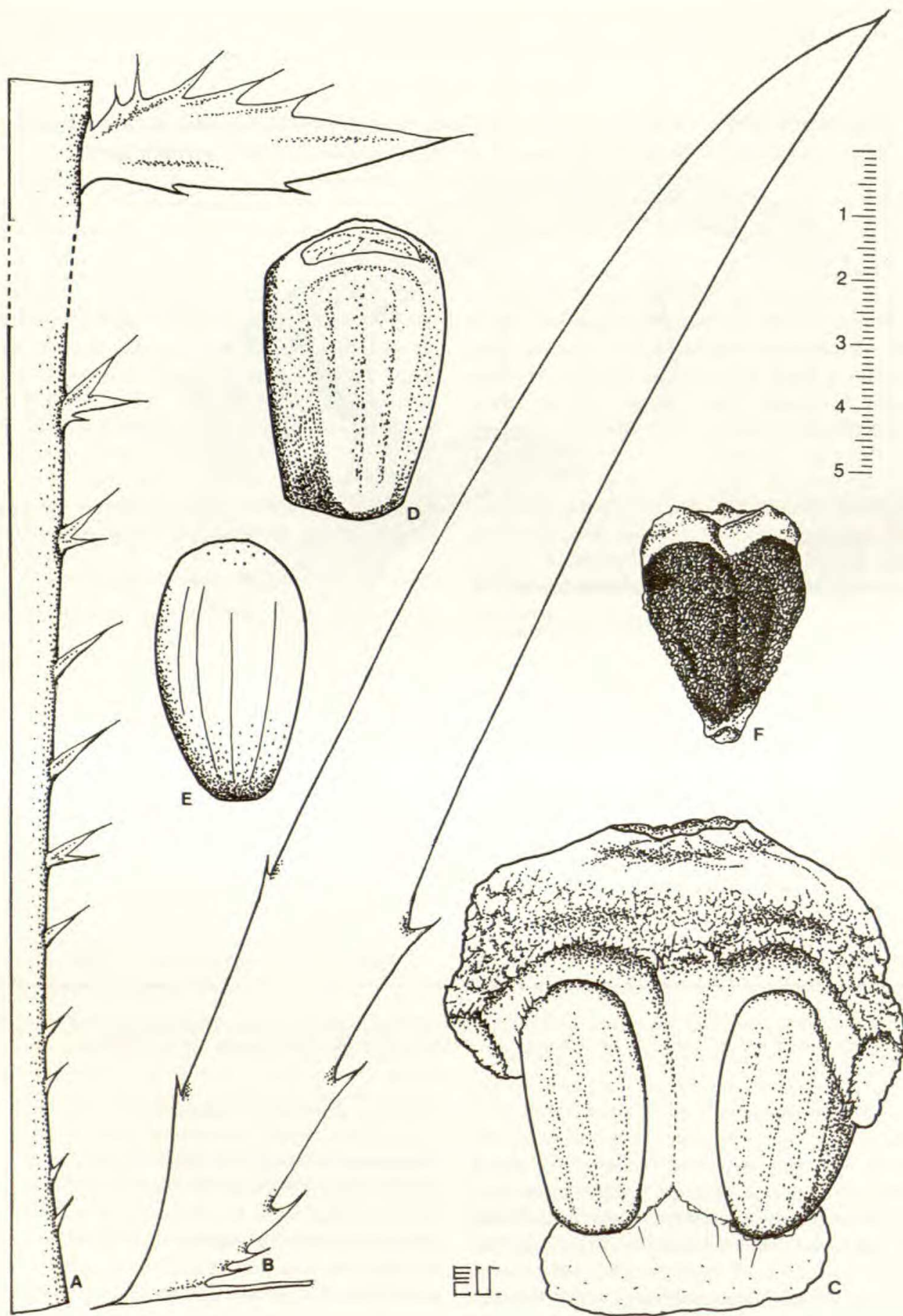


Figure 2. *Encephalartos imbricans* Vorster. —A. Proximal part of petiole. —B. Median leaflet. —C. Megasporophyll in ventral view. —D. Seed with sarcotesta. —E. Seed with sarcotesta removed. —F. Microsporophyll in ventral view. Scale bar = 50 mm. (Heibloem sub Vorster 3034.)



Figure 3. *Encephalartos imbricans* Vorster. Part of median zone of frond, showing incubously overlapping leaflets. Scale bar = 100 mm. (Plant in habitat.)

in cone characteristics, yet these are often useful to circumscribe species, if not always reflecting phylogenetic relationships. It would appear that recurring vegetative characteristics may well be cryptic signposts of evolutionary kinship. The following is therefore intended to identify *E. imbricans*, but is certainly not intended to reflect phylogenetic relationships.

Encephalartos imbricans resembles *E. bubalinus* Melville (Melville, 1957) in its green, ovoid, shortly pedunculate megastrobili (Fig. 4E), but differs by the somewhat wrinkled instead of smooth facets of the megastrobilate bullae (Fig. 4F), and by the long-peduncled instead of almost sessile microstrobili. In both species the leaflets are overlapping, but in *E. imbricans* the leaflets taper gradually to their apices (Fig. 2B), whereas in *E. bubalinus* they are uncinata.

Encephalartos imbricans resembles an undescribed species from western Uganda in its green, ovoid megastrobili, but is readily distinguished by the somewhat wrinkled instead of smooth facets of the megastrobilate bullae, and the mostly strongly

overlapping (Fig. 3) instead of well-spaced leaflets. The concentration of 3–4 teeth near the base of the upper leaflet margin was not seen in the western Ugandan species.

Encephalartos imbricans resembles *E. laurentianus* De Wildeman (De Wildeman, 1903a, b, c, 1907; Bois, 1907; Gentil, 1904a, b; Lebrun, 1930; Robyns, 1948) by its shortly pedunculate, ovoid megastrobili, of which the facets of the bullae are somewhat wrinkled, as well as by the large number of long-pedunculate microstrobili; it is distinguished by the absence of a characteristic thin indumentum of reddish brown trichomes, and green rather than greenish yellow pigmentation of the strobili. Vegetatively, *E. laurentianus* is a very different species, with much larger (up to 500 mm long and 50 mm wide) and softer-textured leaflets.

The new species resembles *Encephalartos septentrionalis* Schweinfurth (Goode, 1989: 236) by its pedunculate, ovoid megastrobili, and long-pedunculate microstrobili, but differs in the very short instead of very long (up to 300 mm) peduncled megastrobili (Goode, 1989: 239) and the glaucous green instead of greenish yellow pigmentation of the strobili. Both species tend to have a concentration of up to 4 teeth near the base of the upper margin of the leaflet, but in *E. septentrionalis* the leaflets are not overlapping but well spaced. Despite being an old species, *E. septentrionalis* is not well known, and in view of its unusually wide geographical distribution (according to the map in Stevenson et al., 1990b: 157) more than one species may be involved. In this respect it is worth noting that the very long megastrobilate peduncle depicted by Goode (1989: 239) is not mentioned elsewhere in the literature.

Encephalartos imbricans resembles *E. sclavoi* De Luca, Stevenson & Moretti (Stevenson et al., 1990a, b) by the ovoid, shortly pedunculate megastrobili as well as by the overlapping leaflets; it differs in that both mega- and microstrobili are green with centrally placed terminal facets on rugose megastrobilate bullae instead of orange-yellow with terminal facets of the smooth megastrobilate bullae situated toward the proximal margins of the bullae, the long (up to 300 mm) instead of very short-peduncled (20–40 mm) microstrobili, and the narrower (up to 22 mm vs. up to 40 mm) leaflets. *Encephalartos sclavoi* lacks the concentration of 3 to 4 teeth near the base of the upper leaflet margin.

Both *Encephalartos imbricans* and *E. turneri* Lavranos & Goode (Lavranos & Goode, 1985) have imbricate leaflets, but in *E. turneri* they are succubous instead of incubous (Fig. 3), they are wider

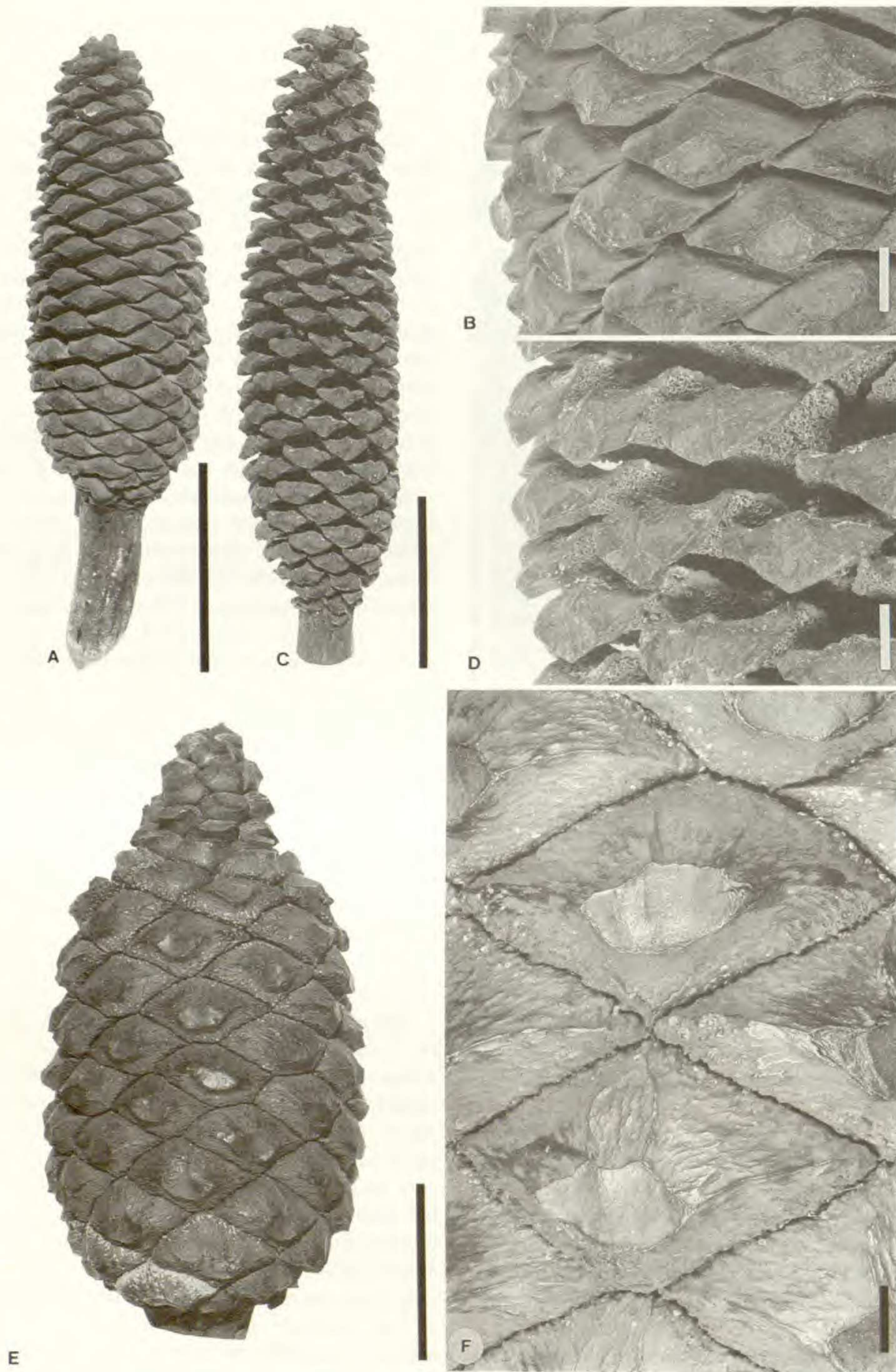


Figure 4. *Encephalartos imbricans* Vorster. —A. Microstrobilus in immature stage. —B. Portion of immature microstrobilus, showing centrally situated terminal facet. —C. Microstrobilus at anthesis. —D. Portion of microstrobilus at anthesis, showing drooping terminal facet. —E. Megastrobilus. —F. Portion of megastrobilus showing rugose facets of bullae. Scale bars (at the right in each photograph): A, C, E = 100 mm; B, D, F = 10 mm. (*Heibloem sub Vorster 3034.*)



Figure 5. *Encephalartos imbricans* Vorster. Plant in habitat, showing habit. Scale bar = 1 m.

(up to 30 mm vs. up to 22 mm), and characteristically the apices are uncinatate instead of tapering to a fine point. In *E. turneri* the megastrobilus is narrowly ovoid instead of ovoid, completely sessile instead of shortly peduncled, and the bullae project more. It bears fewer microstrobili (up to 3 vs. 5–8) on shorter peduncles (up to 120 vs. to 300 mm). In both sexes the cones are not green but yellowish with a conspicuous pink bloom (Lavranos & Goode, 1985).

Encephalartos imbricans resembles *E. ituriensis* Bamps & Lisowski (Bamps & Lisowski, 1990) by its long-peduncled microstrobili. However, in *E. ituriensis* the megastrobilus is shortly cylindrical and the strobili of both sexes are yellow instead of green (Goode, 1989). Moreover, the type collection of *E. ituriensis* (Lisowski 41057, BR) leaves the impression of relatively soft textured and flaccid leaflets as in *E. laurentianus*, in marked contrast to the hard and rigid leaflets of *E. imbricans*.

Other east African arborescent species with which we compared *Encephalartos imbricans* are *E. hildebrandtii* A. Braun & Bouché (Prain, 1915;

Stapf, 1914), *E. kisambo* Faden & Beentje (Faden & Beentje, 1989; Moretti et al., 1989), and *E. tegulaneus* Melville (Melville, 1957). From all these it differs by its glaucous green instead of yellow cones, and the ovoid instead of cylindrical megastrobili. Yet in various respects it resembles these species, which probably indicates a near relationship. In all four species the microstrobili are borne on very long peduncles, which can be up to 300 mm long. In both *E. imbricans* and *E. hildebrandtii* the microstrobili emerge and mature in succession rather than simultaneously. This trait is shared by the undescribed species from western Uganda, by *E. gratus* Prain (Prain, 1916) from Malawi, and *E. ferox* G. Bertoloni (pers. obs.) from southern Mozambique and South Africa, and is suspected to be present in at least some other tropical African species including *E. septentrionalis* and *E. laurentianus*. In the South African species, in the *E. manikensis* (Gilliland) Gilliland complex, the *E. poggei* Ascherson & Graebner group, and in *E. barteri* Carruthers, the cones emerge simultaneously (teste Goode, 1989; pers. obs.). The conspicuous grouping of 3 to 4 teeth near the base of the upper leaflet margin is shared by *E. hildebrandtii* (some specimens, e.g., Faden, Faden & Rathbun 72 136, K), *E. kisambo*, *E. tegulaneus*, *E. bubalinus* (where it is poorly expressed), the Malawian *E. gratus*, and the South African *E. woodii* Sander, and it is tempting to read phylogenetic significance in it.

Melville (1957: 248) briefly described a variety *dentatus* of *E. hildebrandtii*, based on cultivated specimens. Heenan (1977: 281–282) reported that he had rediscovered it near Jinja in Uganda. This is not the same as *E. imbricans*, because *E. hildebrandtii* var. *dentatus* is distinguished by divaricate-dentate medio-lateral ridges on both the micro- and megasporophyllate bullae.

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Figure 6. *Encephalartos imbricans* Vorster. Plants in typical habitat, wedged in crevices in granite outcrop. Scale bar = 1 m.

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